

Appendix 9:

*In re Young*, 927 F.2d 588, 18 U.S.P.Q.2d 1089 (Fed. Cir. 1991)

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In re Young

Court of Appeals, Federal Circuit

No. 90-1368

Decided March 5, 1991

United States Patents Quarterly Headnotes

**PATENTS****[1] Patentability/Validity - Obviousness - Relevant prior art - In general (§ 115.0903.01)**

Apparently conflicting prior art references must, in making obviousness determination, each be weighed for their power to suggest solutions to artisan of ordinary skill, and all disclosures in prior art must be considered to extent that they are in analogous fields of endeavor and thus would have been considered by person of ordinary skill in field of invention; in weighing suggestive power of each reference, degree to which one reference might accurately discredit another must be considered.

**PATENTS****[2] Patentability/Validity - Obviousness - Relevant prior art - Particular inventions (§ 115.0903.03)**

Applicant's claims for method of generating seismic pulse in water by use of at least three air guns disposed at critical distance from each other are obvious in view of prior patent which expressly teaches exact spacing set forth as limitation in each of applicant's claims, even though additional reference purporting to test different methods of pulse generation suggests avoidance of spacing taught in prior patent, since reference did not accurately test prior patent according to its teachings, particularly those regarding spacing, and therefore artisan of ordinary skill would have afforded reference little weight.

**\*1090** Appeal from the U.S. Patent and Trademark Office, Board of Patent Appeals and Interferences.

Patent application of D. Raymond Young and John C. Wride (method and apparatus for generating an acoustic pulse in a body of water). From decision of Board of Patent Appeals and Interferences upholding final rejection of all claims, applicants appeal. Affirmed.

Richard F. Phillips, Jr., Houston, Texas, for appellants.

Lee E. Barrett, associate solicitor (Fred E. McKelvey, solicitor, with him on brief), Arlington, Va., for appellee Patent and Trademark Office.

Before Newman, Lourie, and Rader, circuit judges.

Rader, J.

Raymond Young and his co-inventor John Wride (collectively Young) appeal from the October 31, 1989 and April 18, 1990 decisions of the Board of Patent Appeals and Interferences (Board). These decisions affirmed the final rejection of all claims in their application. The Board held Young's claimed invention obvious under 35 U.S.C. §103. This court affirms.

**BACKGROUND**

Young's application discloses a method and apparatus for generating an acoustic pulse in water. Acoustic pulse technology facilitates offshore seismic exploration. The acoustic pulse generates a large gas bubble in the ocean above geological formations on the ocean floor. The rapid expansion and collapse of the gas bubble create a shock wave in the water. The shock wave propagates through the water into the formations below the ocean bed. As the shock wave passes downward through these formations, each interface between adjoining earth strata reflects a portion of the shock wave. These reflections move upward through the ocean. Hydrophones at the ocean's surface can monitor these reflections. From these monitored reflections, geologists can generate a "seismic section" map which shows the configuration of strata in the ocean

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bed.

Today's most common sources of seismic shock waves are air guns. These air guns feature a chamber for storing and releasing on command highly compressed air. A high-pressure hose charges the gun with compressed air for rapid firing during a seismic survey.

Acoustic pulse technology suffers from problems with bubble oscillation. Upon release of the compressed air, the bubble undergoes a rapid initial expansion and collapse. Several more expansions and collapses follow the initial collapse, but with diminishing amplitude. Each of these expansion-collapse events creates an additional shock wave. The geological strata reflect each of these additional shock waves. The multiple reflections, in turn, blur the resolution of the seismic section. Most blurring comes from the first oscillation after the initial bubble collapse.

Acoustic pulse technology uses a "primary-to-bubble ratio" to measure susceptibility to oscillation. This ratio compares the shock wave intensity of the initial expansion-collapse to the intensity of the first oscillation. A high ratio means the secondary shock waves are less likely to blur the seismic section.

Young tries to raise the primary-to-bubble ratio above prior art air gun sources by reducing the amplitude of the first oscillation. Young seeks this result by spacing at least three air guns in a characteristic array. The array separates the guns from each other by a critical distance. The distance,  $D$ , is at least 1.2 times greater than  $R$ , but less than or equal to twice  $R$ .  $R$  is the maximum radius of the initial air bubble from each gun. [FNa1] With this spacing, the bubbles from each gun intersect before any single bubble reaches its maximum radius. This intersection dampens the overall oscillation. Young's independent claims each include a spacing limitation within this range.

Independent claim 1 is illustrative: A method of producing a seismic pulse in a body of water, including the steps of:

(a) disposing in the water a set of at least three air guns, each adapted to produce in the water a gas bubble having maximum radius

substantially equal to the quantity  $R$ , where the guns are disposed at depths such that each produces, when fired, a bubble of maximum radius  $R$ , and the guns are disposed such that each gun is separated from each of the nearest guns thereto in the set by a critical distance,  $D$ , where  $D$  is substantially equal to  $\sqrt{2}R$ ; and

(b) firing the air guns substantially simultaneously to produce a seismic pulse in the water.

**\*1091** Young's dependent claims define the number of the guns or their placement relative to each other or to the ocean surface.

The examiner rejected each of the claims as obvious under 35 U.S.C. §103 in light of five prior art references. The examiner relied primarily on U.S. Patent No. 2,619,186 to Carlisle (the "Carlisle patent" or "Carlisle") to reject Young's claims. Carlisle is the only reference cited by the examiner or Board which suggests the air gun spacing in Young's claims.

Young contested the Board's and the examiner's consideration of Carlisle. Young argued that Carlisle concerns reducing bubble oscillation for chemical explosives, not air guns. Young also argued that an article by Knudsen published six years after Carlisle in the journal *Geophysics* expressly discredits the teachings of Carlisle. W. Knudsen, *Elimination of Secondary Pressure Pulses in Offshore Exploration (A Model Study)*, 23 *Geophysics* No. 3 at 440 (July 1958) (Knudsen). Therefore, Young contended, a person of ordinary skill in the seismic exploration art would not have considered Carlisle when developing an improved seismic array.

The Board rejected Young's arguments. The Board held that the examiner appropriately applied Carlisle notwithstanding the teachings of Knudsen. On appeal, Young asserts as error only the propriety of applying Carlisle as a reference in light of Knudsen's allegedly contrary teachings.

#### DISCUSSION

This court must decide whether the Board properly affirmed the examiner's rejection over Carlisle. Young has not challenged the other references cited

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in the examiner's rejection. Further, Young has not argued the merits of any particular claim apart from the others. Therefore, all claims stand or fall together with representative independent claim 1. See *In re Kaslow*, 707 F.2d 1366, 1376, 217 USPQ 1089, 1096 (Fed. Cir. 1983).

The Carlisle patent - "Seismic Exploration Method" - issued on November 25, 1952. Carlisle concerns minimizing bubble oscillation for chemical explosives used in marine seismic exploration. Carlisle controls bubble oscillation by spacing seismic sources to achieve a reduction of the secondary pressure pulse. Carlisle specifically teaches spacing the seismic sources close enough to allow the bubbles to intersect before reaching their maximum radius. Carlisle spaces the bubble centers closer than two maximum bubble radii, or less than "2.0 R" in Young's notation. Carlisle, col. 3, lines 57-60. Carlisle explains:

[T]he secondary energy normally available from these sources is dissipated by their mutual intersection and tends to eliminate the secondary seismic impulses created when the walls of the bubbles collapse.

*Id.* at lines 60-64. Thus, Carlisle expressly teaches the spacing limitation in each of Young's claims.

Notwithstanding Carlisle's teachings, Young argues that the Knudsen article discredits Carlisle. Knudsen describes a series of tests which evaluated four proposed techniques for suppressing bubble oscillation. Carlisle was one of the four. Knudsen's article opined that Carlisle yields no appreciable improvement in bubble oscillation suppression. The effective teaching of the Knudsen/Carlisle combination, Young argues, suggests avoidance of the spacing suggested in Carlisle. Therefore, Young would have this court conclude that his use of Carlisle's spacing would not have been obvious.

Young misunderstands the effect that Knudsen has on Carlisle. The test for obviousness is what the combined teachings of the references would have suggested to one of ordinary skill in the art. *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981). Even if tending to discredit Carlisle, Knudsen cannot remove Carlisle from the prior art. Patents are part of the literature of the art and are relevant for all they contain. *In re Lemelson*, 397

F.2d 1006, 1009, 158 USPQ 275, 277 (CCPA 1968). For example, in *In re Etter*, 756 F.2d 852, 859, 225 USPQ 1, 6 (Fed. Cir.), cert. denied, 474 U.S. 828 (1985), a reference which disclosed obsolete technology remained in the prior art. This court considered the reference for what it disclosed in relation to the claimed invention.

[1] When prior art contains apparently conflicting references, the Board must weigh each reference for its power to suggest solutions to an artisan of ordinary skill. The Board must consider all disclosures of the prior art, *In re Lamberti*, 545 F.2d 747, 750, 192 USPQ 278, 280 (CCPA 1976), to the extent that the references are, as here, in analogous fields of endeavor and thus would have been considered by a person of ordinary skill in the field of the invention. The Board, in weighing the suggestive power of each reference, must consider the degree to which one reference might accurately discredit another.

[2] As prior art, the Board correctly weighed Carlisle to determine the patentability of Young's claims. Carlisle expressly teaches both the method and the advantages \*1092 of Young's claimed spacing. In fact, Carlisle expressly teaches the exact spacing set out as a limitation in Young's claims. Thus, the Board correctly attributed significant weight to Carlisle in its obviousness determination.

In determining what weight to accord to Carlisle as prior art, the Board also appropriately considered Knudsen's discrediting effect. The Board determined that Knudsen did not convincingly discredit Carlisle. Therefore, the Board appropriately concluded that Knudsen would not have led one skilled in the art to reject Carlisle.

Knudsen did not test Carlisle according to its teachings. For instance, Knudsen did not use an explosive charge in modeling Carlisle. Rather, Knudsen tried to simulate Carlisle with a capacitive electrical discharge in a barrel of oil.

Knudsen did not replicate Carlisle's teachings on spacing. Knudsen tried to model Carlisle by separating the seismic sources by one, two and three bubble radii. Knudsen at 42. At the maximum spacing of three bubble radii, the bubbles will not intersect at all. Carlisle specifically requires spacing

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to permit bubble intersection. Carlisle, col. 4, lines 47-52. At a spacing of one bubble radius, the two bubbles coalesced into one before the initial collapse. Knudsen at 45. If just one bubble is present, the bubble will oscillate as if no second seismic source was present. Carlisle specifically requires spacing to prevent the formation of one bubble. Carlisle, col. 4, lines 34-37. Finally, at the two bubble radii spacing in Knudsen, the bubbles will just barely intersect. Carlisle requires that the bubbles intersect before each bubble achieves its maximum radius. Carlisle, col. 3, lines 58-60. In sum, Knudsen did not duplicate or appropriately model Carlisle's spacing.

Knudsen's conclusion that Carlisle would "not be effective in eliminating the secondary pressure pulse" also directly contradicts data contained in Knudsen. The Knudsen data point for the two-radii horizontal bubble spacing, although not a completely accurate model of Carlisle, shows a 30% reduction of the secondary pressure pulse. Knudsen at 45, Table 4. This data point represents the only point where Knudsen approximates the spacing shown in Carlisle. At that point, Knudsen confirmed Carlisle's teachings.

The Board found that Knudsen "did not test the Carlisle technique under conditions which are directly comparable to the Carlisle disclosure." Weighing the discrepancies between the Knudsen model and Carlisle's teachings, as well as Knudsen's tendency to confirm Carlisle where the model approximated Carlisle, the Board concluded: "we do not agree that Knudsen discredits Carlisle."

Because Knudsen did not accurately test Carlisle, an artisan of ordinary skill would not have dismissed Carlisle in light of Knudsen as a whole. It is far more likely that the skilled artisan would have afforded little weight to Knudsen itself. The Board did not err in relying on Carlisle and discounting Knudsen.

#### CONCLUSION

Knudsen is not so credible or persuasive of a contrary teaching that it would have deterred the skilled artisan from using the teachings of Carlisle. The examiner's use of Carlisle in his rejection of Young's claims is not clearly erroneous. The

Board's decision affirming the examiner's rejection is therefore *AFFIRMED*.

FNal Mathematically, D is defined by  $1.2 R \leq D \leq 2.0 R$ .

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